

# CYBER 4-20mA with 20mm or 32mm propane sensor

## CROSS REFERENCE FACTOR MANUAL

- *MT4152* -

Rev: 4



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# 1. Introduction

This document is applicable only to Cyber 4-20mA with IRNET 20mm or 32mm propane sensors with 2.1% volume as full scale range.

It is important to note that IRNET/IRNEX 20mm and IRNET 32mm propane sensors are not gas specific sensors, this means that they are sensitive to all the Hydrocarbon gases present in the test environment, as they share the same detection principle. So, it is impossible to discern a single gas in an environment in which is present a mixture of various hydrocarbon gases.

It is possible to calculate the correction factor applying the specific concentration of one other hydrocarbon gas and comparing the response of the propane sensor.

This will not result always in a linear coefficient valid for all gas concentrations levels but it should provide enough accuracy for detector manufacturers, if they can adjust one single correction factor to the sensor's output.

It is moreover important to note that the base calibration gas of the sensor is propane, so temperature compensation is based upon this gas. In some circumstances, when the correction factors are applied on the gas detector, the temperature performances detailed in the sensor datasheet may not be valid anymore.

N.E.T. recommend the customer to perform accurate test in order to define the best correction factor useful for their application, related to temperature range and gas concentration levels.

This document should be used only as a guide, it should not be considered as absolute values; it will be updated thoroughly as new test data will be available. Cross reference factors reported in this document are related only to Cyber 4-20mA with IRNET/IRNEX 20mm or IRNET 32mm sensor.

## 2. Description

Applying a linear cross factor to the Cyber 4-20mA output, it is possible to obtain a good accuracy over the full scale range, comparable to the accuracy of the Cyber 4-20mA when exposed to propane.

All sensor's cross reference factors calculation are reported on:

- MT3456 for IRNET20
- MT4007 for IRNET32

Based on factors calculated on MT3456 and MT4007 the calculation for Cyber correction factor is:

$$K_{CYBER} = K_{GASx} * \frac{LEL_{PRO}}{LEL_{GASx}}$$

**LELpro** = Lower Explosive Level of Propane ( 2.1%Vol )

**LELgasx** = Lower Explosive Level of the applied gas

**Kgasx** = IRNET correction factor of the applied gas

Factors indicated in the tables of next page must be used multiplying the gas concentration reading given by the Cyber 4-20 calibrated for propane (LEL=2.1%vol), expressed in terms of %LEL, to obtain the related concentration expressed in %LEL scale of the applied gas.

It is important to consider that those factors are only valid in case the Cyber 4-20mA full scale is expressed in %LEL scale.

It is important to consider that using linear cross reference factor, temperature compensation is still based upon the propane sensor so may be different errors at temperature away from 25°C.

These factors are recommended to minimize the error over the full scale range and over the temperature range between -40°C and +60°C.

N.E.T recommend to the customer to consider data contained in the table of next page only as a guidance and to verify the accuracy obtained, using the specific test gas.

Cyber 4-20mA with 20mm sensor		
GAS	Correction factor (Kcyber)	LEL (% vol) <sup>Ⓜ</sup>
Acetone	5,29	2,5
Benzene *****	5,86	1,2
Butadiene***	8,21	1,4
Cyclo Hexane****	2,17	1
Cyclopentane	1,16	1,4
Difluoroethane (R152a)	2.51	3,7 <sup>ⓂⓂ</sup>
Dimethyl ether	1,10	2,7
Ethane	1,12	2,4
Ethanol**	2,10	3,1
Ethyl acetate	2,60	2
Heptane	1,66	0,85
Hexane	1,49	1
Isobutane	1,49	1,3
Isobutylene	2,14	1,6
Isopropanol	2,01	2
MEK*****	3,21	1,5
Methanol*****	0,92	6
N-Butane	1,25	1,4
Pentane	1,45	1,1
Propylene	2,53	2
Toluene **** ‘	4,64	1

Cyber 4-20mA with 32mm sensor		
GAS	Correction factor (Kcyber)	LEL (% vol) <sup>Ⓜ</sup>
Acetone	4,73	2,5
Benzene *****	7,25	1,2
Cyclo Hexane****	2,40	1
Cyclopentane	1,19	1,4
Difluoroethane (R152a)	2,30	3,7 <sup>ⓂⓂ</sup>
Dimethyl ether	1,07	2,7
Ethane	1,10	2,4
Ethanol**	1,31	3,1
Isobutane	1,50	1,3
Isobutylene	0,48	1,6
MEK*****	3,40	1,5
Methanol*****	0,89	6
N-Butane	1,28	1,4
Pentane	2,52	1,1
Propylene	2,54	2
Toluene **** ‘	5,38	1

\*\* In this case the cross reference factor is valid only up to 1% VOL.

\*\*\* In this case the cross reference factor is valid only for 25°C

\*\*\*\* In this case the cross reference factor is valid only up to 0,5% VOL and temperatures above 25°C.

\*\*\*\*\* In this case the cross reference factor is valid only up to 2% VOL and temperatures above 0°C.

\*\*\*\*\* In this case the cross reference factor is valid only for temperatures above 0°C.

‘ In this case is not possible to detect correctly concentration below 25% LEL

<sup>Ⓜ</sup> Data extracted from IEC 60079-20-1: 2010

<sup>ⓂⓂ</sup> R152a is not present in IEC 60079-20-1: 2010

Here are indicated, only as a reference, the flash point values of the gases considered in this document.

<b>GAS</b>	<b>Flash point (°C)</b>
Acetone	-17
Benzene	-11
Butadiene	-76
Cyclo Hexane	-17
Cyclopentane	-37
Difluoroethane (R152a)	NA
Dimethyl ether	-42
Ethane	-135
Ethanol	12
Ethyl acetate	-4
Heptane	-1
Hexane	-22
Isobutane	-83
Isobutylene	-80
Isopropanol	12
MEK	-10
Methanol	9
N-Butane	-60
Pentane	-49
Propylene	-108
Toluene	4

### 3. Example

Below is shown an example of a Cyber 4-20mA with IRNET 32mm sensor of propane (LEL=2.1%vol) once has been applied to different gas levels of Butane, with and without correction factor:

Applied Butane gas % Vol	Cyber 4-20mA readings %LEL output on propane scale	Cyber 4-20mA readings %LEL output (with correction factor applied) on Butane scale
0,35 (25%LEL)	21,75	27,84
0,7 (50%LEL)	39,50	50,56
1,05 (75%LEL)	61,82	79,13
1,4 (100%LEL)	81,23	103,97

Applying the correction factor of the previous pages is possible to obtain the sensor response on LEL scale of the applied gas.

N.E.T. strongly recommend the customers to verify the correctness of the suggested factor based on the specific application.

It is also recommended to verify the correctness of the above factors over the complete temperature range.

*N.E.T. has a policy of continuous development and improvement of its products. As such the specification for the device outlined in this manual may be changed without notice.*